

NEW SOUTHERN DOUBLE-STARS.—Mr. H. C. Russell, Government Astronomer at Sydney, has circulated a list of newly-detected double-stars, some found by himself with the large instrument, and others by Mr. Hargrave with the $7\frac{1}{4}$ -inch equatorial. In most cases the components belong to the tenth and eleventh magnitudes.

THE TOTAL SOLAR ECLIPSE OF 1816, NOVEMBER 19.—The first total eclipse of the sun in the present century in which the central line passed over Europe took place on the morning of November 19, 1816. Maps of its track appeared in the *Berliner Jahrbuch* for 1816, and in the first part of Hallaschka's *Elementa Eclipsium*, where the full computation of this eclipse is given as an example. In Lindenau and Bohnenberger's *Zeitschrift für Astronomie*, vol. v., Hagen gives the moon's place deduced from Buerckhardt's Tables, with the horizontal parallax and semi-diameter: if we combine these with similar quantities for the sun, taken from Carlini's Tables of 1833, we find the following elements of the eclipse:—

G.M.T. of Conjunction in R.A. 1816 Nov. 18 at 21h. 46m. 57s.

R.A.	234 42 20
Moon's declination	18 37 9 S
Sun's " " " " " " " "	19 30 29 S
Moon's hourly motion in R.A.	36 58
Sun's " " " " " " " "	2 37
Moon's " " " " Decl.	11 37 S
Sun's " " " " " " " "	0 38 S
Moon's parallax	60 15
Sun's " " " " " " " "	0 9
Moon's semi-diameter	16 25
Sun's " " " " " " " "	16 12

In the *Berliner Jahrbuch* Bode makes the eclipse total at both Dantzic and Warsaw; the above elements do not show totality at either place, but give the magnitudes 0.990 and 0.992 respectively. They indicate, however, a total eclipse at Bromberg, duration 1m. 22s. Possibly there may be other observations of the totality on record, but the only one we have found was made by Hagen at Culm in Bohemia, where he observed its commencement but not the ending. It would appear that the weather at this season was an impediment to observation, or more details of the total phase in its passage over Germany might have been expected. Before the eclipse of July 1842 there was only one in which the line of totality approached near the European continent, viz. that of July 17, 1833, which was total in Iceland; on Mount Hecla the total eclipse commenced at 4h. 56m. 37s. a.m., and continued two minutes, the sun at an altitude of 13° ; but the days of physical observations had not then arrived, and we do not find it recorded that a midsummer expedition to Iceland was organised.

CHEMICAL NOTES

THERE has of late been a considerable amount of work done on the relations between the composition and structure of chemical compounds and various physical constants of these compounds; and also on the relations between the conditions of chemical change and some of the physical properties of the constituents of the changing systems. Among the more important work on the former class of relations are to be mentioned Perkin's researches on the *magnetic rotatory polarisation* of compounds (*C. S. Journal*, *Trans.* for 1884, p. 421 *et seq.*); and Schiff's researches on the *coefficients of capillarity* of liquid carbon compounds (*Annalen*, cccxiii. 47). The investigations of Raoult on the connections between the freezing-points of solutions and the distribution of the salts therein form an important contribution to the study of the second group of relations (see especially *Ann. Chim. Phys.* (6), ii. p. 66, *et seq.*). Perkin has measured the rotations of the plane of polarisation of a ray of monochromatic (sodium) light, produced by passing the ray through columns of various liquid carbon compounds placed between the poles of a large electro-magnet. Then, by the use of the formula $\frac{r \times M}{d}$, where r = observed rotation,

d = density, and M = molecular weight (as gas), of the given compound, he has calculated the magnetic rotatory effect of unit-length of the liquid obtained by condensing unit-length of the vapour of the same liquid. The observed results are thus referred to lengths of liquid related to each other in the ratio of the molecular weights of the various compounds examined.

Each result is divided by the number obtained, by the same method, for water, and the quotient represents the *molecular rotatory power* of the given compound. The molecular rotatory powers of a great many compounds belonging to twenty-six series have been determined, and the results show that the constant in question is closely connected with the valencies of the atoms, and with the distribution of the interatomic actions, in the molecules of the compounds examined. Schiff has made an extended series of determinations of the *coefficients of capillarity*, that is the capillary elevations in tubes 1 mm. radius, of many liquid carbon compounds. By multiplying this constant by the density of the compound, and dividing by 2, another constant is obtained which represents the weight of liquid raised by capillary action through unit-length of the line of contact between the liquid and the containing vessel. Lastly, by dividing the coefficient of capillarity by twice the "molecular volume" (*i.e.* $\frac{\text{molecular weight of gas}}{\text{density of liquid}}$), a quotient is obtained

which represents the relative number of molecules raised along the line of contact between the liquid and solid surfaces. Schiff's results, although very numerous, do not yet allow very definite conclusions to be drawn regarding the connection between the three constants and the molecular structure of the compounds examined; but that a definite connection exists is rendered very probable by these investigations. Raoult has made many determinations of the *molecular lowering of the freezing-point*—that is, the lowering of the freezing-point produced by the solution of 1 gramme-molecule of substance dissolved—of various solvents by acids, bases, and salts. The solvents employed were water, benzene, nitro-benzene, ethylene dibromide, acetic and formic acids. In each case the molecular lowering of the freezing-point is approximately equal to one of two values, of which one is double the other. The acids examined may be divided into two groups as regards their effect on lowering the freezing-point of water. The value of the constant measured by Raoult is approximately 40 for one of the groups, and 20 for the other group. The bases examined likewise fall into two groups; the mean values of the constants being 39 and 19 respectively. Raoult states that the acids with the higher value (40) almost completely displace the acids with the lower value (20) from their combinations with bases, when the acids and salts react in equivalent quantities. The bases of the first group almost completely displace those of the second from their combinations with acids. Measurements of the molecular lowering of the freezing-point of water by the action of acids, bases, and salts, present us with data from which, according to Raoult, the distribution of the various acids, &c., in a changing chemical system may be deduced.

AMERICAN ORNITHOLOGISTS' UNION

THE second annual meeting of the American Ornithologists' Union was held in the American Museum of Natural History, New York City, September 30 to October 2, 1884, the President, Mr. J. A. Allen, in the chair.

The Active Members present were: J. A. Allen, H. B. Bailey, Chas. F. Batchelder, Eugene P. Bicknell, William Brewster, Montague Chamberlain, Dr. Elliott Coues, D. G. Elliot, Dr. A. K. Fisher, Col. N. S. Goss, Dr. J. B. Holder, Dr. C. Hart Merriam, Robert Ridgway, Thomas S. Roberts, John H. Sage, George B. Sennett, Dr. Leonhard Stejneger.

Dr. Philip Lutley Sclater, Mr. Howard Saunders, and the Rev. E. P. Knubley, of the British Ornithologists' Union, were also present, and were cordially invited to take part in the proceedings of the Union.

The Associate Members in attendance were William Dutcher, Fred T. Jencks, and Dr. Howard Jones.

On the recommendation of the Council the following persons were elected to Foreign Membership:—Heinrich Gätke, Heligoland; Dr. W. Taczanowski, Russia; Henry Seebohm, England; Howard Saunders, England; Dr. H. Burmeister, Brazil.

The following among others were elected Corresponding Members:—Dr. John Anderson, F.R.S., India; W. T. Blanford, F.R.S., London; Major H. W. Feilden, London; Dr. Hans Gadow, England; Col. H. H. Godwin-Austen, London; Dr. Julius von Haast, New Zealand; Dr. E. Holub, Austria; Dr. C. F. Homeyer, Germany; E. L. Layard, New Caledonia; Dr. A. B. Meyer, Germany; Dr. A. von Mojsisovics, Gratz; Dr. A. J. Malmgren, Finland, Dr. A. von Middendorff,

Russia; Col. N. Przevalsky, Russia; Dr. Gustav Radde, Russia; Dr. Leopold von Schrenck, Russia; Dr. W. Severtzow, Russia; Rev. Canon H. B. Tristram, England; Dr. Hjalmar Theel, Sweden.

The report of the Committee on Revision of Nomenclature and Classification of North American Birds was presented by the Chairman, Dr. Elliott Coues, who said that the work of the Committee had been divided by the creation of two Sub-Committees: one (consisting of Messrs. Ridgway, Brewster, and Henshaw) to determine the status of species and sub-species; the other (consisting of Mr. Allen and Dr. Coues) to formulate the canons of nomenclature and classification adopted by the Committee. He also expressed the indebtedness of the Committee to Dr. Leonhard Stejneger for determining many points in synonymy, and for other aid. Dr. Coues then read at length the report of the Sub-Committee on Codification of Canons of Nomenclature and Classification, as adopted by the full Committee. The reading occupied about an hour and a half. Mr. Ridgway continued the report by reading the list of species prepared by the Sub-Committee on the Status of Species and Sub-Species as adopted by the full Committee. The Committee unanimously adopted the tenth edition of Linnæus's "Systema Naturæ" as the starting-point in zoological nomenclature; it unflinchingly avowed its adherence to the rule of priority; and emphatically and unequivocally indorsed the employment of trinomial in the designation of sub-species.

The report of the Committee on Bird Migration was presented by the Chairman, Dr. C. Hart Merriam. Dr. Merriam stated that a circular had been issued setting forth the objects and methods of the Committee, specifying the division of the territory of the United States and British North America into thirteen districts (each of which had been placed in charge of a competent superintendent), and supplying instructions to observers concerning the data desired—which were classed under the heads of Ornithological, Meteorological, and Contemporary and Correlative Phenomena.

In order to secure a large number of observers, the Chairman had written to the editors of eight hundred newspapers, asking them to call attention to the work of the Committee and to state that more observers were desired. The several superintendents had also written to a large number of papers—just how many the Chairman was not aware. The Press very kindly gave the matter the prominence its importance deserved, and abstracts of the circulars, amounting in some cases to an actual reprint, and usually coupled with editorial comment, were published in several hundred newspapers. This resulted in the receipt by the Chairman of upwards of three thousand applications for circulars of information and instruction. In all, nearly six thousand circulars were distributed. By this means the Committee finally secured nearly seven hundred observers, in addition to the keepers of lights. The observers are distributed as follows:—Mississippi Valley district, Prof. W. W. Cooke, Superintendent, 170; New England district, John H. Sage, Superintendent, 142; Atlantic district, Dr. A. K. Fisher, Superintendent, 121; Middle-Eastern district, Dr. J. M. Wheaton, Superintendent, 90; Quebec and the Maritime Provinces, Montague Chamberlain, Superintendent, 56; district of Ontario, Thomas McIlwraith, Superintendent, 38; Pacific district, L. Belding, Superintendent, 30; Rocky Mountain district, Dr. Edgar A. Mearns, Superintendent, 14; Manitoba, Prof. W. W. Cooke, Superintendent, 10; British Columbia, John Fannin, Superintendent, 5; North-West Territories, Ernest E. T. Seton, Superintendent, 5; Newfoundland, James P. Howley, Superintendent (returns not yet received). Migration stations now exist in every State and Territory in the Union excepting Delaware and Nevada.

The Committee was fortunate in obtaining the co-operation of the Department of Marine and Fisheries of Canada, and of the Lighthouse Board of the United States. By this means it secured the free distribution of upwards of twelve hundred sets of schedules and circulars to the keepers of lighthouses, lightships, and beacons in the United States and British North America.

The returns thus far received from observation were exceedingly voluminous and of great value. They were so extensive, indeed, that it was utterly impossible for the Committee to elaborate them without considerable pecuniary aid.

In order to show the Union the character and extent of the labours of the Committee, the Chairman had requested the superintendents of all districts east of the Rocky Mountains to prepare reports upon five common, well-known, and widely-

distributed birds, to wit: the robin (*Merula migratoria*), cat-bird (*Mimus carolinensis*), Baltimore oriole (*Icterus gabula*), purple martin (*Progne subis*), and nighthawk (*Chordeiles popetue*). This had been done, and the reports received were presented for examination. The Chairman directed special attention to those prepared by Dr. J. M. Wheaton and Dr. A. K. Fisher as examples of tabulated returns, and to that received from Prof. W. W. Cooke as an example of the generalisation of results.

The Chairman called attention to the action of the International Ornithologists' Congress held in Vienna last April, stating that he had been instructed (in common with the delegates from other countries) to represent the cause of the Committee in the National Government, begging it "to further to the utmost the organising of migration stations," and "to appropriate a sufficient sum for the support of these stations, and for the publication of annual reports of the observations made."

The Council was instructed to memorialise the Congress of the United States, and the Parliament of Canada, in behalf of the work of the Committee on Bird Migration.

On the motion of Mr. Brewster, the Committee on Geographical Distribution was merged into the Committee on Migration as a Sub-Committee, the whole Committee to be entitled a "Committee on the Migration and Geographical Distribution of North American Birds."

The Report of the Committee on the Eligibility or Ineligibility of the European House-Sparrow in America was presented by Dr. J. B. Holder, Chairman of the Committee. Dr. Holder said that a circular of inquiry had been printed, and about one thousand copies circulated in Canada and the United States. Particular pains had been taken to secure evidence from those who advocated the cause of the sparrow. A large number of returns had been received, and the evidence for and against the naturalised exotic had been carefully sifted and summarised. The result overwhelmingly demonstrated that the sum of its injurious qualities far exceeds and cancels the sum of its beneficial qualities. In other words, it was the verdict of the Committee that the European house-sparrow is not an eligible bird in North America. The Union sustained the decision of the Committee.

The Report of the Committee on Faunal Areas was presented by the Chairman, Mr. J. A. Allen. Mr. Allen said that, for the purposes of the Committee, North America had been divided into several districts, each of which had been placed in charge of a member of the Committee as follows:—Arctic and British America and the northern tier of States bordering the Great Lakes, from New York to Minnesota inclusive, were being worked by Dr. C. Hart Merriam; Canada, south of the St. Lawrence, and New England, by Arthur P. Chadbourne; the Eastern and Middle States, from New Jersey to Florida, and west to the Mississippi River, by Dr. A. K. Fisher; the Rocky Mountain region by Dr. Edgar A. Mearns; and the Pacific region by L. Belding. It was the plan of the Committee to collate and tabulate the required data from all published sources; to avail itself in like manner of the material contained in the returns of the observers of bird migration (this privilege having been granted by the Committee on Bird Migration); to illustrate the facts thus obtained by coloured maps showing the summer and winter range of each species; and to generalise the final results and place the same before the Union, accompanied by coloured charts showing, with as much precision as possible, the exact limits of the several faunal areas in North America.

Dr. P. L. Sclater said he was glad to know that North America, which he knew as a *Nearctic* region, was being worked in so thorough a manner by so competent a Committee, and that the results obtained could not fail to be of great interest and value.

The matter of the wholesale slaughter of our native birds for millinery and other purposes was brought forcibly before the Union by Mr. Wm. Brewster, and a Committee was appointed for the protection of North American birds and their eggs against wanton and indiscriminate destruction.

Dr. Merriam spoke of the capture, just two weeks previously (September 19), of a second specimen of the wheatear (*Saxicola ænanthe*) at Godbout, on the north shore of the St. Lawrence, by Mr. Napoleon A. Comeau. Mr. Comeau exhibited the bird, a handsome male, and said that he shot the first specimen at the same place on May 18 last. He also spoke of the capture at Godbout of the European house-sparrow (*Passer domesticus*), thus extending the known range of the species, on the north shore, by at least 250 miles.

Dr. Leonhard Stejneger exhibited a stuffed specimen of a willow grouse from Newfoundland, which he regarded as a new geographical race, differing from the continental form chiefly in the possession of more or less black upon its primaries. Mr. Brewster said that he had recently examined 150 specimens of ptarmigan from Newfoundland, and had observed the peculiarities pointed out, but did not consider them constant. He was inclined to regard the characters mentioned as seasonal, and possibly to some extent individual. Dr. Stejneger replied that this coloration of the wing feathers could not possibly be seasonal as they (the primaries) were moulted but once a year. Dr. Merriam stated that during a recent visit to Newfoundland he had examined a very large number of willow grouse in the flesh, and was still engaged in investigating the change of colour in this species. His studies led him to disagree with Dr. Stejneger's last statement. He (Dr. Merriam) was convinced that change in colour in individual feathers did take place, both independent of and coincident with the moult. Mr. D. G. Elliot agreed with Mr. Merriam in considering the change of colour of individual feathers an established fact. An animated discussion followed, and was participated in by Messrs. Brewster, Comeau, Coues, Elliot, Merriam, Ridgway, and Stejneger.

In response to a call from the President, Dr. P. L. Slater said:—

"I hope the members of the American Ornithologists' Union will excuse me if I offend the feelings of any one by the remarks I am about to make. It has aggrieved me much to find in this country three large and valuable collections of birds which are not under the care of paid working ornithologists. One of these is in Boston, one in New York, and the other in Philadelphia. Each contains what all ornithologists admit to be most valuable typical specimens. A grave responsibility rests upon the possessors of types of species, and the loss or injury of such specimens is a great and irreparable loss to science. The collection of the Boston Society of Natural History (known as the La Frenayé Collection) has been much damaged by neglect, and the entire collection ought to be catalogued and so arranged as to render any particular specimen readily accessible. In this building (the American Museum of Natural History in New York) are the types of the celebrated Maximilian Collection, and many other specimens of exceeding great value. A large number of these have never been properly identified, and some of them are missing and have doubtless been destroyed by insect pests. The value of others has been lost through neglect, by the displacement of labels, and by the omission of proper measures for their preservation. The same remarks would, in a general way, apply to the collections of the Philadelphia Academy of Natural Sciences. It is sad to find no paid ornithologists in charge of these exceedingly valuable collections, and I beg to suggest that the American Ornithologists' Union can undertake no worthier task than to impress upon the proper authorities the urgent necessity of immediate action in this matter."

The officers of the Union were re-elected as follows:—President, J. A. Allen, Cambridge; Vice-Presidents, Dr. Elliott Coues and Robert Ridgway, Washington; Secretary and Treasurer, Dr. C. Hart Merriam, Locust Grove, New York.

The place of meeting for next year was referred to the Council for decision.

THE CAPILLARY CONSTANTS OF LIQUIDS AT THEIR BOILING-POINTS

THE paper of Prof. Robert Schiff, published in *Liebig's Annalen*, March 1884, on this subject, marks the first successful attempt out of many that have been made to connect the surface-tension of a liquid with its molecular constitution.

It has long been known that the tension diminishes rapidly with a rise of temperature, but the importance of this fact when it is desired to make a comparative examination of different liquids has not been fully appreciated or sufficiently insisted on till now by Prof. Schiff, who has to lament that, out of the considerable array of experimental investigations on the subject which he has examined, very few results could be extracted which could be usefully employed in such a comparative study, a failure which he attributes to the completely arbitrary and dissimilar physical conditions under which the different substances in question have been examined.

Since it is impossible to compare surface-tensions at the critical point, because that is the point at which the surface-tension vanishes, it is necessary to seek some other condition in which

different liquids may be physically comparable, and that which naturally suggested itself for trial to Prof. Schiff, was the boiling-point of the liquid itself, whose significance in this respect he has himself established.

The principle of his method was to select with great care two capillary glass tubes of perfectly cylindrical bore, but of different diameters, that of the wider being about 1.3 mm., and of the narrower about half as much. These two tubes are then united into a little U-tube (about 7 cm. long), which, after being partly filled with the experimental liquid, is hung in a wider vessel, at the bottom of which a little of the same liquid is kept boiling. From the difference of level of the liquid in these two connected capillary tubes, as measured at a temperature which must be very nearly the boiling-point, the surface-tension at that temperature is readily deduced, since the method of procedure involves the thorough wetting of the upper portion of the tube with condensed liquid.

In this manner Prof. Schiff has determined the surface-tension at the boiling-point of some sixty liquids, with a possible error which he estimates at 1.75 per cent. of the mean value—at the worst, 2.4 per cent. His results may be stated as follows:—

1. For isomeric liquids that are chemically comparable, the surface-tension at the boiling-point is the same (within the limits of observational error). The observations do indeed point in the case of isomers of one class to a fall in surface-tension with a fall in the boiling-point, while in another class there is a perceptible rise with a rise in the boiling-point, but these variations are within the limits of possible errors of observation.

2. The quantity which turns out to be that on which attention should be fixed is not the surface-tension itself, but the surface-tension divided by the molecular weight, a quantity to which the author gives a vivid significance by pointing out that, in the case of a capillary elevation against a vertical wall wetted by the liquid, it is proportional to and represents the *number of molecules raised above the free surface per unit length of the wall*; for, since the tension per unit length is equal to the weight of the total number of molecules lifted, this tension divided by the weight of each molecule gives the total number lifted.

To the surface-tension in milligrams per millimetre divided by the relative molecular weight (and multiplied for convenience by 1000), Prof. Schiff accordingly assigns the symbol *N*, and his results show that not only is this number *N* the same for isomeric substances (as is implied in the previous statement), but that it is often the same for liquids of very different chemical constitution. He then proceeds to examine the formulæ of such chemically different liquids which have the common property that *N* is the same, in the manner exemplified in the following illustration:—

"Taking all the different substances for which *N* is nearly 16, we find—

Hexane, C_6H_{14}$	...	...	...	N =$	16.1
					16.0
Xylol, ethyl-benzol, C_8H_{10}$	...	...	...	N =$	15.9
					15.8
					16.2
					15.8
					15.6
With the formula $C_5H_{10}O_2$	...	...	...	$N =$	15.6
					15.9
					15.7

"This indicates that substances with the formulæ



are, so far as concerns the value of the number (*N*) of molecules lifted, equivalent to each other.

" C_6H_{14} differs from C_8H_{10} in having C_2 less and H_4 more; accordingly, so far as concerns the constant *N*,

$$2C = 4H.$$

" C_8H_{10} differs from $C_5H_{10}O_2$ in having C_3 more and O_2 less, so that, with reference to the constant *N*,

$$3C = 2O."$$

In order to test whether these equivalences are accidental or not, he examines other series, for which *N* has respectively the value 10.5, 13, 27, &c., but always with the same result, so that he concludes that these equivalences are not chance coincidences, but that it is really possible to replace a certain number of atoms of one kind by a certain number of another kind without producing in the value of *N* an alteration which comes within the limits of precise observation.